




SI Keyfob Transmitter Data Guide

Wireless made simple®

 **Warning:** Some customers may want Linx radio frequency (“RF”) products to control machinery or devices remotely, including machinery or devices that can cause death, bodily injuries, and/or property damage if improperly or inadvertently triggered, particularly in industrial settings or other applications implicating life-safety concerns (“Life and Property Safety Situations”).

NO OEM LINX REMOTE CONTROL OR FUNCTION MODULE SHOULD EVER BE USED IN LIFE AND PROPERTY SAFETY SITUATIONS. No OEM Linx Remote Control or Function Module should be modified for Life and Property Safety Situations. Such modification cannot provide sufficient safety and will void the product’s regulatory certification and warranty.

Customers may use our (non-Function) Modules, Antenna and Connectors as part of other systems in Life Safety Situations, but only with necessary and industry appropriate redundancies and in compliance with applicable safety standards, including without limitation, ANSI and NFPA standards. It is solely the responsibility of any Linx customer who uses one or more of these products to incorporate appropriate redundancies and safety standards for the Life and Property Safety Situation application.

Do not use this or any Linx product to trigger an action directly from the data line or RSSI lines without a protocol or encoder/decoder to validate the data. Without validation, any signal from another unrelated transmitter in the environment received by the module could inadvertently trigger the action.

All RF products are susceptible to RF interference that can prevent communication. RF products without frequency agility or hopping implemented are more subject to interference. This module does not have a frequency hopping protocol built in.

Do not use any Linx product over the limits in this data guide. Excessive voltage or extended operation at the maximum voltage could cause product failure. Exceeding the reflow temperature profile could cause product failure which is not immediately evident.

Do not make any physical or electrical modifications to any Linx product. This will void the warranty and regulatory and UL certifications and may cause product failure which is not immediately evident.

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SI Keyfob Transmitter

Data Guide



Description

The Linx SI Series Keyfob transmitter is ideal for remote control and command applications. Available in 418 (standard) or 433.92MHz versions, it has been pre-certified for FCC Part 15, Industry Canada, and European CE (433MHz) compliance. This dramatically reduces development cost and time to market. The high-performance synthesized design provides superior frequency accuracy and minimizes body proximity effects. When combined with a Silicon Labs Si4355 receiver, the Keyfob can operate at distances of up to 1000 feet. Ease of use and security are dramatically enhanced by the use of Silicon Labs Ember One-Way Link protocol with AES-128 encryption. The Keyfob is available with 1 to 5 buttons and can be custom labeled.

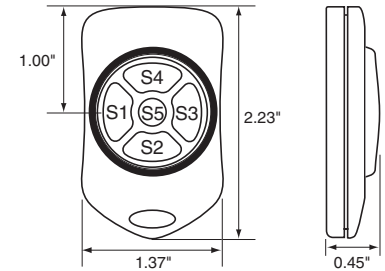


Figure 1: Package Dimensions



Figure 2: Keyfob Button Configurations

OEM Configurations

With a one-time NRE and minimum order, Linx can configure the keypad and label areas. Contact Linx for details.

Features

- FCC, IC and CE pre-certified
- Long range
- Simple user setup
- Factory preset unique address
- 1 to 5 buttons
- Compact, stylish package

Applications

- General remote control
- Keyless entry
- Garage / gate openers
- Lighting control
- Home / industrial automation
- Wire elimination

Ordering Information

Ordering Information	
Part Number	Description
OTX-***-HH-KF#-SI-xxx	SI Keyfob Transmitter
MDEV-***-HH-KF#-SI	SI Keyfob Development System
*** = 418 (Standard) or 433.92MHz xxx = Color (Leave blank for standard black) WHT = White CRE = Red CGY = Gray	

Figure 3: Ordering Information

Electrical Specifications

Keyfob Electrical Specifications						
Parameter	Designation	Min.	Typ.	Max.	Units	Notes
Power Supply						
Operating Voltage	V_{CC}	2.1	3.0	3.6	VDC	
Supply Current	I_{CC}		3.4		mA	
Power-Down Current	I_{PDN}		5.0		nA	1
Transmitter Section						
Transmit Frequency Range	F_C					
OTX-418-HH-KF#-SI			418		MHz	
OTX-433-HH-KF#-SI			433.92		MHz	
OTA Modulation			2FSK			
Center Frequency Accuracy		-50		+50	kHz	
Frequency Deviation			59.05		kHz	
Data Rate			9,600		bps	
Environmental						
Operating Temperature Range		-40		+85	°C	1
1. Characterized, but not tested						

Figure 4: Electrical Specifications

Theory of Operation

The SI Series Keyfob Transmitter combines a high-performance synthesized SoC transmitter with an on-board microcontroller input interpretation. The transmitter's advanced synthesized architecture delivers superior stability and frequency accuracy while minimizing the effects of temperature and body proximity.

The Keyfob operates in the following manner: when a button is pressed on the Keyfob, the transmitter and microcontroller are woken from sleep mode. The microcontroller detects the logic states of the button data lines. The button data line logic states are sent from the microcontroller to the transmitter as a serial data packet. The transmitter SoC generates a 42-byte encrypted packet and transmits a three-packet burst for each button press through the antenna and into free space. On the receiver side, a Si4355 checks the preamble, the sync bytes and the CRC of the transmitted packet. If the packet is OK the receiver responds to the button logic state data in the manner programmed into the receiver by the end user.

The transmitter is compatible with the Silicon Labs Si4355 receivers using the Silicon Labs Ember One-Way Link protocol.

Transmitter Address

The unique address for each unit is preprogrammed in the Silicon Labs radio IC during manufacturing and cannot be changed or modified by the end user. A 16-byte pairing key is programmed into the transmitter at the factory and is shared with the associated receiver during the pairing process.

Button Assignments

The Keyfob is available in five button configurations. Those configurations and the corresponding switch numbers are shown in Figure 5. The table shows which encoder data line has been assigned to each switch. When a button is pressed, the data line goes high, causing the corresponding data line on the decoder to go high if the address has been learned.

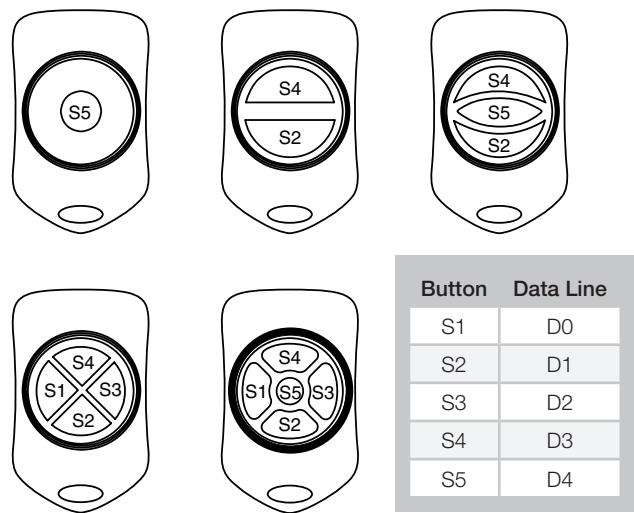


Figure 5: OTX-***-HH-KF#-MS Button Assignments

Contention Considerations

It is important to understand that only one transmitter at a time can be activated within a reception area. While the transmitted signal consists of encoded digital data, only one carrier of any particular frequency can occupy airspace without contention at any given time. If two transmitters are activated in the same area at the same time, then the signals will interfere with each other and the decoder will not see a valid transmission, so it will not take any action.

Battery Replacement

The transmitter utilizes a standard CR2032 lithium button cell. In normal use, it provides 1 to 2 years of operation. Access for replacement is accomplished by gently prying apart the two halves of the Keyfob at the seam (fingernails or a coin will do). Once the unit is open, remove the battery by sliding it out from beneath the retainer.

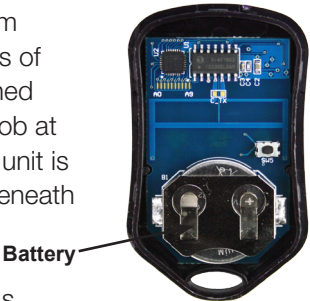


Figure 6: Battery Access

There may be the risk of explosion if the battery is replaced by the wrong type. Replace it with the same type of battery while observing the polarity shown in Figure 6.

Assembly Diagram

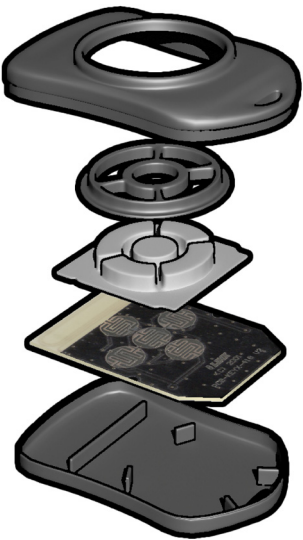


Figure 7: OTX-***-HH-KF#-MS Assembly

Labeling / Instruction Requirements

The transmitter has been pre-certified for FCC Part 15 and Industry Canada license-exempt RSS standards for an intentional radiator. The 433.92MHz version has also been tested for CE compliance for use in the European Union. The 418MHz version is not legal for use in Europe. It has already been labeled in accordance with FCC, Industry Canada and CE regulations. No further labeling of the unit is needed; however, it is necessary to include the following statement in the end product's instruction manual or insert card. EU does not require a statement.

INSTRUCTION TO THE USER

This device complies with Part 15 of the FCC Rules and Industry Canada license-exempt RSS standard(s). Operation of this device is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio / TV technician for help.

The user is cautioned that changes and modifications made to the equipment without the approval of manufacturer could void the user's authority to operate this equipment.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radioexempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Support

For technical support, product documentation, application notes, regulatory guidelines and software updates, visit www.linxtechnologies.com

RF Design Services

For customers who need help implementing Linx modules, Linx offers design services including board layout assistance, programming, certification advice and packaging design. For more complex RF solutions, Apex Wireless, a division of Linx Technologies, creates optimized designs with RF components and firmware selected for the customer's application. Call +1 800 736 6677 (+1 541 471 6256 if outside the United States) for more information.

Antenna Factor Antennas

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customers with specialized needs, custom antennas and design services are available along with simulations of antenna performance to speed development. Learn more at www.linxtechnologies.com.



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